

**USDOE Hanford Site**

**First Five Year Review Report**

Prepared by:  
The U.S. Environmental Protection Agency  
Region 10, Hanford Project Office

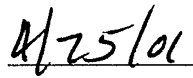
April 2001

**USDOE HANFORD SITE  
FIRST FIVE YEAR REVIEW REPORT**

**CERTIFICATION AND APPROVAL**

A handwritten signature in black ink, appearing to read "M. Gearheard", written over a horizontal line.

Michael F. Gearheard, Director  
Office of Environmental Cleanup  
U.S. Environmental Protection Agency  
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A handwritten date "4/25/01" in black ink, written over a horizontal line.

Date

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## Foreword

### General

The U.S. Department of Energy's (DOE's) Hanford Site, which was established to produce nuclear materials for national defense, covers approximately 586 square miles adjacent to the City of Richland in Benton County of Washington State. When the Hanford Site was placed on the National Priorities List (NPL) in 1989, it was divided into four NPL sites: the USDOE Hanford 100 Area, 200 Area, 300 Area, and 1100 Area. Each NPL site was further divided into operable units to simplify the response. An operable unit is a grouping of individual sites based primarily on geographic area or common waste sources; soil and groundwater contamination are usually in separate operable units. In anticipation of the NPL listing, DOE entered into the *Hanford Federal Facility Agreement and Consent Order* (also known as the Tri-Party Agreement or TPA) with the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology). The TPA established the legal framework and schedule for the cleanup at Hanford. For each operable unit, the TPA designates either EPA or Ecology as the lead regulatory agency.

EPA Region 10 has conducted the first five-year reviews of the remedial actions implemented at the four NPL sites at the Hanford Site. The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of those five-year reviews are documented in this five-year review report. This five-year review report also identifies deficiencies found during the review, if any, and identifies recommendations to address them.

These reviews of the Hanford Site are required by statute. EPA must implement five-year reviews in a manner consistent with the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) and the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). CERCLA §121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This report documents the results of the five-year reviews that were conducted from February 2000 through September 2000. The four NPL sites are discussed in separate sections. The scope of the TPA is broader than this five-year review because the TPA addresses regulated *Resource Conservation and Recovery Act* (RCRA) units, as well as the cleanup of past practice

units required under RCRA and/or CERCLA. Only operable units listed as past-practice units in the TPA are covered in this five-year review report. Removal of radiologically-contaminated structures, if conducted pursuant to the 1995 *Policy on Decommissioning Department of Energy Facilities Under CERCLA*, is also included. Active treatment, storage, or disposal units, such as the Hanford tank farms, are not part of this review.

### 100 Area

The 100 Area consists of six nuclear reactor areas that are principally contaminated with radionuclides and metals and, to a lesser extent, with other contaminants such as organic chemicals and asbestos. In addition to the reactor areas, there are outlying waste sites whose principal contaminants are metals and organic chemicals. The 100 Area five-year review covers eleven decision documents that have resulted, or will result, in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. The primary cleanup actions that will be performed in the 100 Area are removal of contaminated soil, decontamination and/or demolition of contaminated buildings, removal of underground contaminated pipes and other engineered structures, capture and treatment of contaminated groundwater that would otherwise flow into the Columbia River, and removal of spent nuclear fuel and associated waste from water-filled basins that have a history of leaks. Institutional controls are an additional component of the selected remedies.

Several of the cleanup actions that were reviewed (namely removal of contaminated soil, decontamination and/or demolition of buildings, removal of underground pipes and other structures, and clean-out of the spent nuclear fuel basins) have achieved or are on track to achieve the “protection of human health and the environment” criteria that was set forth in the decision documents. Several minor recommendations for those cleanup actions are provided in this review. The principal deficiency is that the pump-and-treat remedial action for capturing and treating several chromium-contaminated groundwater plumes has not achieved the required protectiveness criteria because of insufficient capture of the plume. The five-year review recommends optimizing and running the extraction/treatment system more reliably.

### 200 Area

The 200 Area of the Hanford Site was used for chemical processing and for waste management. These activities generated radioactive, hazardous, and mixed wastes that were disposed of into the soil column and resulted in large amounts of contaminated soil and groundwater in the 200 Area. This five-year review is focused on the inactive soil disposal area, inactive facilities, contaminated groundwater, and the Environmental Restoration Disposal Facility (ERDF). Ongoing waste management activities, active treatment, storage, or disposal facilities and tank farm operations are not included in this review.

The 200 Area is divided into 23 soil operable units. These units contain approximately 700 soil waste sites and associated structures, as well as numerous facilities requiring decontamination and decommissioning. In addition to the 23 soil operable units, the 200 Area

NPL site contains four groundwater operable units, two of which (200-ZP-1 and 200-UP-1) are in 200 West Area and two of which (200-BP-5 and 200-PO-1) are in 200 East Area.

The 23 soil operable units are in various stages of the remedial investigation/feasibility study process and are currently on schedule for the completion of all required investigations by 2008. Only two soil operable units have had a remedy selected. One of these, the Environmental Restoration Disposal Facility (ERDF), has also been constructed. The review of ERDF indicated that the facility is operating in an environmentally protective manner and no change to current operations is needed. There are no issues associated with the cleanup of the 233-S Plutonium Concentration Facility.

Review of the 200-ZP-1/200-ZP-2 carbon tetrachloride project revealed several areas of concern that will need to be addressed to ensure protection of human health and the environment. Soil vapor extraction has been used to remove carbon tetrachloride from the soil for the past 8 years. Vapor extraction was highly successful during the first several years of the project, removing more than 150,000 pounds of carbon tetrachloride. However, during the past 3 years, removal efficiency has dropped significantly and little carbon tetrachloride has been removed. DOE and EPA are currently reviewing applicable technologies that will enhance removal of carbon tetrachloride from both soil and groundwater.

A review of the 200-UP-1 Pump-and-Treat System for removing uranium and Technetium-99 from 200 West Area groundwater revealed that the system has been partially successful in removing the technetium but has had little effect on uranium concentrations. DOE and Ecology need to develop a strategy to enhance removal of uranium from the 200 Area groundwater in order to ensure protection of human health and the environment.

### 300 Area

The 300 Area consists of three operable units. The 300-FF-1 and 300-FF-2 Operable Units address contamination at soil waste sites and burial grounds associated with operations in the 300 Area. The primary cleanup actions involve the removal of contaminated soils and debris; treating the material, as appropriate; and disposing of the material in an appropriate facility. Institutional controls are an additional component of the selected remedies. The 300-FF-5 Operable Unit addresses groundwater contamination beneath the soil waste sites and burial grounds. The current decision for contaminated groundwater in the 300 Area is to monitor the groundwater plumes to ensure that they are attenuating to acceptable concentrations through natural processes. Part of the cleanup includes controlling use of the cleanup areas and the groundwater.

In general, the 300 Area cleanups are proceeding in a protective and effective manner. EPA still considers the cleanup goals and remedy selection decisions appropriate at the time of this review. However, the review outlines a number of action items that DOE must perform in order to ensure that (1) the remedy remains protective, and (2) appropriate information is being gathered to document that the remedy is achieving the goals established in the Record of Decision. For example, an active and enforceable institutional controls plan is required. In

addition, DOE must demonstrate that soil cleanup levels are protective of groundwater, that biological resources are not being adversely impacted, and that contaminated groundwater plumes are attenuating to acceptable concentrations through natural processes in a reasonable length of time.

### 1100 Area

The 1100 Area was divided into four operable units. All of the remedies have been completed, and the 1100 Area has been deleted from the NPL. The remedies at three of the operable units (1100-EM-2, 1100-EM-3, and 1100-IU-1) allow for unrestricted use and unlimited exposure. Hazardous substances remain in one operable unit (1100-EM-1) at levels that do not allow for unlimited use and unrestricted exposure. The Horn Rapids Landfill was used for asbestos disposal and was closed in accordance with asbestos regulations. Also, the groundwater in the vicinity of the Horn Rapids Landfill is contaminated with trichloroethene; the remedy was to allow the contamination to attenuate. Institutional controls are a component of the selected remedies, specifically to maintain the landfill fence and cap and to prevent use of the contaminated groundwater. The only deficiency found during the review was that the fence around the landfill needs some repair.

### Action Items

The following table is a summary of the action items to address deficiencies identified during the reviews. The first action item, SW-1, is a site-wide issue that crosscuts each of the NPL sites. Each section contains a complete list of the action items and additional recommendations for an NPL site. Some of the action items may represent new work, as defined by the TPA, and therefore the due date and the subsequent schedule to implement those requirements will be subject to negotiation.

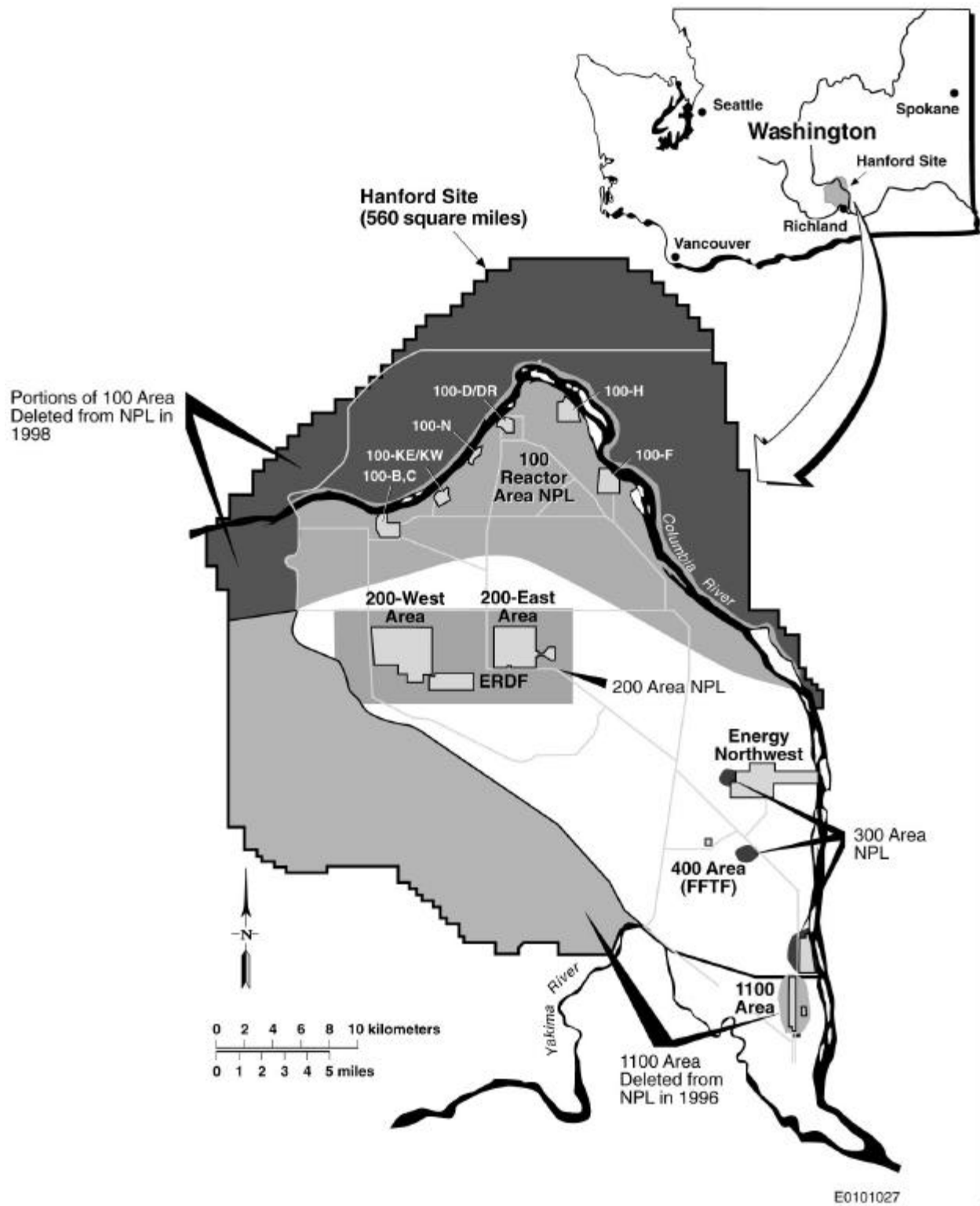
<b>Action Item</b>	<b>Description</b>	<b>Due Date</b>
SW-1	DOE shall develop a site-wide institutional controls plan for the Hanford Site. EPA will initiate modifications to appropriate remedy selection decision documents to incorporate the requirements.	July 2001

Action Item	Description	Due Date
100-1	<p>DOE shall optimize and complete system enhancements to the 100-HR-3 and 100-KR-4 groundwater pump-and-treat systems for chromium to run more reliably and achieve the required cleanup levels.</p> <ul style="list-style-type: none"> <li>• The overall system up-time must improve.</li> <li>• The downtime for individual wells must be dramatically reduced.</li> <li>• A much higher percentage of the targeted plume must be captured.</li> </ul> <p>For 100-KR-4, the plan to achieve these enhancements is the following:</p> <ul style="list-style-type: none"> <li>• Complete the design for system enhancements by September 2001.</li> <li>• Acquire an additional treatment skid and support systems.</li> <li>• Build and annex or additional building to house the new treatment skid.</li> <li>• Install an extraction well to bridge the gap between existing extraction wells K-120A and K-119A.</li> <li>• Install a new injection well.</li> </ul> <p>For 100-HR-3, the plan to achieve these enhancements is the following:</p> <ul style="list-style-type: none"> <li>• Complete the design for system enhancements by September 2001.</li> <li>• Upgrade treatment and support systems to increase capacity and reliability.</li> <li>• Install an additional extraction well in the 100-D Area.</li> </ul>	May 2002
100-2	DOE shall investigate alternative remedial action technologies for the removal, mass reduction, and/or attenuation of Strontium-90 from the 100-NR-2 aquifer sediments and to further reduce the net flux of Strontium-90 to the river. This investigation will be documented in a letter report to support a ROD amendment. The letter report will include a recommendation and schedule for a path forward based on the ITRD conclusions and agreement from Ecology.	December 2001
200-1	DOE shall evaluate enhancements to the 200-PW-1 soil vapor extraction system in order to remove carbon tetrachloride from the vadose zone, and shall provide this information to EPA.	December 2001

Action Item	Description	Due Date
200-2	The Tri-Parties should continue to investigate applicable dense non aqueous phase liquid (DNAPL) detection technologies and enhancements to the current pump-and-treat system.	December 2001
200-3	DOE shall install at least one monitoring/production well within the high-concentration area of the carbon tetrachloride plume near PFP. This well shall be installed by DOE in FY 2001 to support characterization needs, enhancement to pump-and-treat and/or vapor extraction system operations, and DNAPL investigations.	September 2001
200-4	The Tri-Parties shall develop a monitoring network for the entire 200-ZP-1 Operable Unit. Currently, the monitoring network for the 200-ZP-1 Operable Unit only focuses on the area affected by the pump-and-treat operations. The monitoring network will be documented in a sampling and analysis plan that will be submitted to EPA, the lead regulatory agency for 200-ZP-1, for approval.	March 2002
200-5	DOE shall comply with the 200-UP-1 RAO of 50 gallons per minute by utilizing additional extraction well[s] by December 2001. DOE shall also initiate pumping from well 299-W23-19 to meet the RAO of 10 times the MCL for Technetium-99. DOE shall complete evaluation of the capability of 299-W23-19 to achieve RAOs, and if that well is not capable of meeting the cleanup level, DOE shall establish a path forward by December 2001 to achieve the goal of the interim remedial action.	December 2001
200-6	The Tri-Parties shall develop a monitoring network for the entire 200-UP-1 Operable Unit. Currently, the monitoring network for the 200-UP-1 Operable Unit only focuses on the area affected by the pump-and-treat operations. The monitoring network will be documented in a sampling and analysis plan that will be submitted to Ecology, the lead regulatory agency for 200-UP-1, for approval.	March 2002
200-7	The Tri-Parties shall develop a monitoring well network for the 200-PO-1 Operable Unit. The monitoring network will be documented in a sampling and analysis plan that will be submitted to Ecology, the lead regulatory agency for 200-PO-1, for approval.	December 2002
200-8	The Tri-Parties shall develop a monitoring well network for the 200-BP-5 Operable Unit. The monitoring network will be documented in a sampling and analysis plan that will be submitted to EPA, the lead regulatory agency for 200-BP-5, for approval.	December 2002

Action Item	Description	Due Date
200-9	DOE shall complete the Phase III Feasibility Study for the Canyon Disposition Initiative to support the development of a September 2002 ROD.	September 2001
300-1	DOE shall propose an updated structure for the 300 Area cleanup verification packages (CVPs) and a path forward to closing out the CVPs by the due date. The 300-FF-1 Remedial Design/Remedial Action work plan may need to be updated at a later date to reflect new requirements. Supplemental information may have to be documented in the file for completed CVPs as well.	June 2001
300-2	DOE will submit a path forward for the 618-4 burial ground to EPA. The path forward will address: (1) options for treatment and disposal of excavated drums, (2) options for continued storage of drums if treatment is not imminent, and (3) plans for completing the excavation of the burial ground.	June 2001
300-3	DOE shall submit options to EPA for expedited response actions to address contaminant releases from the 618-11 Burial Ground as well as an assessment of the need for interim action based on the results of the 618-11 groundwater investigation. The options for interim action and assessment of their need shall be submitted to EPA by September 2001.	September 2001
300-4	DOE shall update and expand the operations and maintenance (O&M) plan for the 300-FF-5 Operable Unit. The revised O&M plan shall be submitted to EPA for approval and shall address: 1) requirements for monitoring groundwater and river springs in the 300-FF-5 operable unit; 2) requirements for monitoring any impacts that may be associated with contaminated groundwater and river spring discharges; 3) requirements for evaluation of groundwater data including an assessment of the effectiveness of the natural attenuation remedy; and 4) regulatory reporting requirements. DOE shall submit a revised O&M plan by September 2001. DOE shall implement the revised O&M plan as approved by EPA.	September 2001
1100-1	DOE shall replace the loose fenceposts around the Horn Rapids Landfill.	April 2001
1100-2	DOE shall replace missing asbestos warning signs around the Horn Rapids Landfill.	March 2001

## Hanford Site National Priority List Designations



## List of Acronyms

ARAR	applicable or relevant and appropriate requirement
BEHP	bis(2-ethylhexyl)phthalate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CVP	cleanup verification package
DCG	derived concentration guide
D&D	decontamination and decommissioning
DDT	dichlorodiphenyltrichloroethane
DNAPL	dense, non aqueous phase liquid
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ESD	explanation of significant difference
FY	fiscal year
HASP	health and safety plan
HRL	Horn Rapids Landfill
IC	institutional control
ISRM	in-situ redox manipulation
IU	isolated unit
MCL	maximum contaminant level
MEI	maximally exposed individual
MTCA	Model Toxics Control Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
ppm	parts per million
RA	remedial action
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RTD	remove, treat, dispose
TCE	trichloroethene
TPH	total petroleum hydrocarbon
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and disposal
USDOE	U.S. Department of Energy
VOC	volatile organic compound
WAC	Washington Administrative Code
WDOH	Washington State Department of Health